EXHIBIT

16

ASSESSMENT OF TRAFFIC FLOW DURING MOTORCYCLE EVENTS IN MYRTLE BEACH, SC

Carolina Harley-Davidson Dealers Association Myrtle Beach Rally 2003 and Atlantic Beach Bikefest 2003

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OVERVIEW

This report provides an assessment of traffic flow and the traffic control plan associated with two motorcycle rally events held in the Myrtle Beach, SC area during May 2003. The Carolina Harley-Davidson Dealers Association Myrtle Beach Rally ("Harley Week"), was a 10-day event held May 9-18, 2003. This rally, held for many years in the Myrtle Beach area, regularly attracts several hundred thousand enthusiasts of Harley-Davidson motorcycles. Following Harley Week was the Atlantic Beach Bikefest ("Black Bike Week"), held May 23-25, 2003. This event primarily attracts motorcycle enthusiasts who are African American college students and young professionals. Black Bike Week, which has a much shorter history than Harley Week, has attracted comparable crowds to the Myrtle Beach area. The event has drawn criticism from local citizens because of its size and allegations of attendee misbehavior. As a result, the City of Myrtle Beach has taken measures to control the event. These include maintaining a large law enforcement presence during the event and aggressively controlling traffic. Despite the similar size of the two rallies, the traffic control plans are very different.

DATA SOURCES FOR THIS REPORT

This section describes the sources of information used in formulation of the assessment and the development of subsequent opinions.

Documents reviewed

In the course of this analysis, the author reviewed the following documents:

- Aerial photographs of Myrtle Beach area taken May 24, 2003
- Law enforcement plans for Harley Week and Atlantic Beach Rally for years 1998-2003
- Memos and sample law enforcement plans provided to the City of Myrtle Beach by other jurisdictions
- Complaint and response
- U.S.G.S. 7-1/2 minute topographic maps-Myrtle Beach and Ocean Forest quadrangles
- Large scale Horry County Highway Map, Accurate Maps & Atlas, Inc., ISBN 1-57738-198-2
- Pavilion Area Master Plan, Myrtle Beach, SC, Ehrenkrantz Eckstut & Kuhn Architects PC, January 1998
- SC 1995 Average Annual Daily Traffic, South Carolina Department of Transportation
- Articles from Myrtle Beach Sun Times related to the events
- Additional documents provided with this report.

The author reserves the right to augment this report and the opinions contained herein based upon the results of ongoing discovery, additional depositions, and additional documents that may be provided.

BACKGROUND

Myrtle Beach, SC is a major destination for tourists and tourism related events. For many years, these events have included a number oriented particularly to motorcyclists and motorcycle enthusiasts. Two events, held annually in the spring, have grown in popularity to the point where they each attract several hundred thousand people to the area. The Carolina Harley-Davidson

Dealers Association Myrtle Beach Rally ("Harley Week") is oriented to owners of Harley Davidson motorcycles. This event, held for many years in the Myrtle Beach area, presently takes place during a 10-day period in mid-May. The Atlantic Beach Bikefest ("Black Bike Week") follows on Memorial Day weekend in May, a time when many other beachgoers also head to the Myrtle Beach area. This event attracts predominantly African American motorcycle enthusiasts who are students and young professionals. From the author's observation, Harley Week attendees are predominantly Caucasian. Thus, the racial composition of the two events is significantly different.

Because of their size, these motorcycle events significantly increase the traffic in and around Myrtle Beach. Although Harley Week has activities at numerous venues in the area, and Black Bike Week is technically focused on the community of Atlantic Beach, both events bring large numbers of attendees to the traditional downtown center of Myrtle Beach. Much of this traffic circulates along Kings Highway and Ocean Boulevard, both of which run north-south through the city. Kings Highway, a major arterial road in Myrtle Beach, is the local name for US Highway 17-Business. It serves as a major entryway to downtown Myrtle Beach for traffic from other beach communities to the north and south. Ocean Boulevard (SC-73) departs from Kings Highway south of downtown Myrtle Beach, parallels several blocks to the east for approximately 10 miles, and then rejoins Kings Highway north of the downtown. The closest major road to the seashore in Myrtle Beach, Ocean Boulevard provides access to beachfront hotels, residences, businesses, and attractions such as the Pavilion. Cross streets link Ocean Boulevard and Kings Highways at many points. The characteristics of the street network will be discussed in more detail in following portions of the report.

For many years, Ocean Boulevard has been a popular route for drivers "cruising" along the strip of hotels, businesses, and attractions in downtown Myrtle Beach. Because of the connections with each end of Ocean Boulevard, along with the many interconnecting cross-streets, Kings Highway is frequently used as part of the circular cruising pattern. As Myrtle Beach has become more intensively developed, both roads have had an increasingly difficult time handling recreational drivers. Ocean Boulevard's primary role is to provide access to beach area hotels, residences, and businesses. "Cruising" vehicles can lead to excessive congestion, making travel difficult for guests and residents who need to access properties along the road. Accordingly, Myrtle Beach officials prepare traffic control plans to address the flow of traffic during special events such as the motorcycle rallies. A traffic plan normally seeks to maintain access to properties for residents and patrons, ensure unrestricted movement by law enforcement and emergency responders, keep through traffic on major thoroughfares, prevent illegal parking, and expedite traffic flow.

As events attracting large numbers to the Myrtle Beach area, both Harley Week and Black Bike Week do receive planning attention from city officials. Ocean Boulevard is the focus of much of the traffic planning. Many of the attendees to the events stay at hotels along Ocean Boulevard or flock to the Boulevard to visit stores, restaurants, and attractions. Others cruise Ocean Boulevard and Kings Highway. Despite the similarity of the Harley Week and Black Bike Week (size and interest in motorcycles), the traffic control plans developed by Myrtle Beach are very different. From a technical standpoint, it is unclear why this is so. This report is intended to present the findings of a review of the traffic plans and an on-scene inspection of the traffic during portions of Harley Week 2003 and Black Bike Week 2003.

DESCRIPTION OF FACILITIES

This section of the report describes the street system in more detail.

Ocean Boulevard

The portion of Ocean Boulevard of interest in this report extends from 29th Avenue North south to the intersection with Kings Highway. Within this section, the road is classified as an urban minor arterial. The term arterial connotes mobility, but Ocean Boulevard is poorly suited for this purpose because it provides a significant amount of access to adjoining properties and connects with numerous purely local streets. Safety and congestion dictate low speed limits along the Boulevard. As a result, through travel times along Ocean Boulevard can be significantly longer than for paralleling routes.

Ocean Boulevard normally carries bidirectional traffic on a cross-section nominally wide enough for four traffic lanes. However, portions of the road have the outer two lanes restricted to either transit use or parking (on a seasonal or permanent basis). Therefore, Ocean Boulevard operates as a two-lane road in these sections.

As previously mentioned, Ocean Boulevard has many driveway accesses to serve adjacent properties. In addition, side streets intersect at frequent intervals (approx. 0.10 mile) along much of the section of interest.

Speed limits on Ocean Boulevard are 25 mph through the downtown, increasing to 35 mph nearing the intersection with Kings Highway. These limits are compatible with the traffic entering and leaving the road from the driveways and side streets.

Signalized intersections are located along Ocean Boulevard at the following locations (north to south) in the study area:

- 11th Avenue North,
- 9th Avenue North,
- 8th Avenue North,
- 7th Avenue North,
- 3rd Avenue South, and
- Kings Highway.

Left turns from Ocean Boulevard are prohibited at 8th Avenue North and 7th Avenue North.

According to SCDOT data, average annual daily traffic volumes along Ocean Boulevard in 1995 ranged from 8,300 on the north end of the study area to 16,100 near the southern intersection with Kings Highway. The Pavilion Area Master Plan quotes count data for the pavilion area of 29,500 per day. The plan attributes this to cruising behavior.

In the downtown area, Ocean Boulevard handles significant pedestrian traffic. Sidewalks are provided along both sides of the street.

Kings Highway

Kings Highway is an urban major arterial. For the purposes of this study, the section of interest extends from the intersection with Ocean Boulevard north to 29th Avenue North.

Kings Highway is essentially a divided four-lane urban street south of the intersection with U.S. Highway 501, and a six lane urban street north of there. While Kings Highway is bordered by commercial development along much of its length through the downtown, its wide cross section and geometric alignment makes it much better suited than Ocean Boulevard for through traffic. On-street parking is generally not allowed.

As with Ocean Boulevard, Kings Highway has frequent driveway cuts to serve adjacent properties. In addition, side streets intersect at frequent intervals (approx. 0.10 mile) along much of the section of interest. Many of these side streets extend eastward to Ocean Boulevard.

Speed limits on Kings Highway range from 45 mph on the north and south portions of the study section to 25 mph through downtown.

Signalized intersections are located along Kings Highway at the following locations (north to south) in the study area:

- 29th Avenue North,
- 25th Avenue North,
- 21st Avenue North,
- 16th Avenue North,
- 11th Avenue North,
- 9th Avenue North,
- 8th Avenue North,
- 3rd Avenue South,
- 6th Avenue South,
- 9th Avenue South,
- 13th Avenue South,
- 17th Avenue South, and
- 21st Avenue South (emergency), and
- Ocean Boulevard.

According to SCDOT data, average annual daily traffic volumes along Kings Highway in the study area for 1995 ranged from 32,500 at the junction with US-501 to 18,000 near the intersection with Ocean Boulevard. The impact of cruising behavior on peak flows is not stated in the Master Plan, although it must be a factor given the proximity to paralleling Ocean Boulevard.

SUMMARY OF EVENT TRAFFIC PLANS

As previous mentioned, the City of Myrtle Beach uses separate traffic control plans for Harley Week and Black Bike Week. This section presents the relevant aspects of these two plans, specifically with regard to Ocean Boulevard, Kings Highway, and connecting avenues.

Harley Week

The traffic plan employed during Harley Week 2003 (and typical of previous years) provided for 2-lane operation of Ocean Boulevard, with one lane of traffic flow in each direction. The outside (curb) lanes were restricted to emergency vehicles only between 21st Avenue North and 3rd Avenue South. All on-street parking was prohibited between 29th Avenue North and 29th Avenue

South, although provision was made at several locations for off-street motorcycle parking. The two inside lanes handled traffic, with one lane for each direction, northbound and southbound.

Access to and from Ocean Boulevard was specifically provided at 21st Avenue North, 16th, 11th, 9th, 8th North, 3rd South, 6th, 9th, 13th, and 17th Avenue South. Each of these avenues is signalized at its Kings Highway intersection, with 11th North, 9th, 8th, and 3rd South also signalized at Ocean Boulevard. Left turns are not allowed from Ocean Boulevard to 8th Avenue North.

The plan did not mention overriding the operation of the traffic signals along Ocean Boulevard. However, officers were directed to monitor intersections controlled by signals and direct traffic if necessary to relieve congestion and prevent blocking. However, officers were instructed not to direct traffic off of the Boulevard lest this be construed as extending the ban on cruising.

The plan made no special provisions for traffic on Kings Highway.

Black Bike Week

The traffic control plan for Black Bike Week restricted Ocean Boulevard to one way travel southbound between 29th Avenue North and 29th Avenue South near the intersection with Kings Highway. The two north bound lanes between these locations were reserved for use by emergency vehicles and law enforcement. On-street parking was prohibited between 29th Avenue North and 29th Avenue South. The plan did not provide for off-street motorcycle parking.

Barricades were placed at intersections to prevent right turns off of Ocean Boulevard except at 21st Avenue North, 3rd Avenue South, 13th Avenue South, and 17th Avenue South. The author observed that the barricades did not restrict the movement of vehicles onto Ocean Boulevard from the side streets.

The Black Bike Week plan did not specify altering the operation of traffic signals along Ocean Boulevard. Traffic direction by officers is not mentioned as in the Harley Week Plan. Indeed, the plan seems more focused on law enforcement concerns rather than traffic operations.

Operating patterns along Kings Highway are not altered by the plan.

TRAFFIC STUDY METHODOLOGY

The study team consisted of the author and eight (8) students from Clemson University, with most from the graduate program in transportation engineering. The team was equipped to collect traffic count data, speed data, photographs, and video for later use in analyzing operating conditions. Their general objective was to evaluate traffic conditions at points along Ocean Boulevard and Kings Highway during the two weekends.

Approach

This section presents the data collection methods used for the study.

Traffic Counts

In traffic studies, vehicle count data is extremely useful in evaluating the quality of operations of roadway sections and intersections. Count data is typically collected by direction of movement at 5-minute intervals. These data may be further broken down by type of vehicle. For intersections, the volume by movement (right turn, through, left turn) for each approach is of interest.

Traffic counts were conducted manually by team members using both electronic and mechanical counters. The team elected not to use automated counters for a number of reasons, foremost being safety concerns regarding placement and retrieval of such counters in heavy traffic. In addition, automated counters are poorly suited to conducting intersection type counts with multiple approaches and movements. Team members using mechanical counters recorded their counter readings at 5-minute intervals on data sheets. One electronic intersection count device binned and stored the data internally. At the conclusion of each day, a team member downloaded the stored data in this device to a personal computer.

Except where traffic was too heavy to classify, team members recorded separate counts for motorcycles and other motor vehicles. This later allowed computation of the percentage of motorcycles in the total traffic stream.

The team size allowed simultaneous counts to take place at four to five locations in the study area. The goal was to conduct counts for at least one hour at each location of interest; count periods actually ranged in duration from ½ hour to several hours. It was recognized before beginning the study that the number and duration of counts would be limited by the team size, time lost redeploying within the congested study area, and periodic meal, bathroom, and rest breaks. Regardless, sufficient data was collected to achieve the desired objectives.

Moving Vehicle Studies

The team planned to use a technique called the Moving Vehicle Method (MVM) to estimate average speeds, hourly volumes, and travel times along some sections of Ocean Boulevard and Kings Highway. The method could provide an interesting comparison to counts and speed measurements taken at point locations. In theory, traffic measurements should reflect conditions within a segment rather than at a point. However, data collection is easier at point locations. Six or more data collection circuits within the desired segment are typically needed to produce statistically robust MVM results. With the team size and three available vehicles, use of the MVM would have to be limited. The two team members (driver and recorder) assigned to each MVM run were not available for counts.

Several MVM counts were conducted during Harley Week at a time of day before traffic congestion reached a peak. Though the data was interesting, the amount of time required for the desired number of data collection circuits, even with modest congestion, was a concern. When congestion increased, it became apparent that the team members could more productively conduct static counts. No MVM counts were conducted during Black Bike Week.

Speed Measurements

The team was equipped to measure spot vehicle speeds using radar. Two team members were required for such a study. Some measurements were taken during both Harley Week and Black Bike Week. Measured vehicle speeds were, with few exceptions, no higher than and generally well below the posted speed limit. In highly congested sections of Ocean Boulevard, pedestrians frequently outpaced vehicles. Very few drivers anywhere were observed exceeding the speed limit, and these were near the north end of Kings Highway where traffic was generally light. Accordingly, completion of speed studies was abandoned in favor of counts.

Photographs and Videos

Team members used photographs and videotape to record traffic and roadway conditions for later study. Videotape was taken from a vehicle in the traffic stream during both weekends. Team

member traveled on foot along sections of Ocean Boulevard to take additional video and still photographs.

The team was provided with aerial photographs of the Myrtle Beach area, including the portions of Ocean Boulevard and Kings Highway of interest. The photographs showed traffic at several times during the afternoon of Saturday, May 24, 2003 while Black Bike Week was in progress. Rain prevented similar photography during Harley Week.

Other Observations

In addition to the data discussed above, the team members were asked to observe aspects of the roadway environment, traffic and pedestrian behavior, and law enforcement. They discussed their perceptions in a group setting with the author at the conclusion of each day's activity.

In addition, when not conducting counts, team members having cars drove other roadways in the Myrtle Beach area (including Grissom Parkway, U.S. 501, Oak Street, U.S. Highway 17, and Kings Highway south of the city limits towards Surfside Beach) to observe travel conditions.

Event Specific Activities

Data collection activities and general results specific to each event are presented below.

Harley Week 2003

The study team traveled to Myrtle Beach during the afternoon of Friday, May 16, 2003. The plan was to arrive in time to observe and start data collection during the late evening hours, when traffic was expected to be heavy along Ocean Boulevard. Rain fell in Myrtle Beach during the evening, however, greatly reducing the amount of motorcycle traffic. Accordingly, data collection was delayed until the following day.

The team returned to Myrtle Beach during the early morning of Saturday, May 17. Traffic volumes during the morning hours were very light along both Kings Highway and Ocean Boulevard. Discussion with several cyclists indicated that traffic would be much heavier in the afternoon and evening hours. The morning was spent observing the study area, selecting locations for counts, and preparing for the counts. It was decided to monitor traffic at locations bracketing the Pavilion area, with its concentration of signalized intersections, on both Kings Highway and Ocean Boulevard. Ocean Boulevard began to be congested approaching this area from both directions beginning in the early afternoon.

Team members spent the afternoon and evening hours of May 17 conducting counts at locations along Ocean Boulevard, Kings Highway, and 21st Avenue North. Counts started at 1:40pm and continued until 10:40pm. During the early evening, several MVM studies were performed on segments of Ocean Boulevard and Kings Highway.

Table 1 summarizes the locations and duration of these counts. The table also contains average and maximum flow rates in vehicles/hour for each count. Unless a direction (e.g. SB) is specified, flow rates represent totals for both directions. The significance of these figures will be discussed later in the report.

Table 1. Count Data-Harley Week 2003

Date	Time	Location	Average Flow Rate (veh/hr)	Maximum Flow Rate (veh/hr)
5/17/03	13:40-16:40	Kings Hwy@16th Ave N (NB)	01665	02268
5/17/03	13:45-14:45	Ocean Blvd@14th Ave N	00926	01212
5/17/03	14:45-15:45	Ocean Blvd@14th Ave N	00949	01080
5/17/03	16:10-17:10	Ocean Blvd@14th Ave N	00782	00876
5/17/03	13:45-14:45	Ocean Blvd@7th Ave S	01925	02340
5/17/03	14:45-15:45	Ocean Blvd@7th Ave S	01787	02004
5/17/03	15:45-16:45	Ocean Blvd@7th Ave S	01699	02148
5/17/03	13:25-14:25	Kings Hwy@13th Ave S (NB)	01588	01884
5/17/03	14:25-15:25	Kings Hwy@13th Ave S (NB)	01655	02136
5/17/03	15:25-16:25	Kings Hwy@13th Ave S (NB)	01682	02112
5/17/03	~16:00 (MVM)	Ocean Blvd 29N-21N	00811	--
5/17/03	~18:00 (MVM)	Ocean Blvd 29N-21N	00937	--
5/17/03	~1800 (MVM)	Kings Hwy 13S-23S (SB)	00840	--
5/17/03	~1800 (MVM)	Kings Hwy 13S-23S (NB)	00949	--
5/17/03	21:20-22:25	Ocean Blvd@14th Ave N	00751	00888
5/17/03	21:20-22:20	21st Ave N	00320	00456
5/17/03	21:15-22:15	Kings Hwy@3rd Ave S (NB)	01756	02148
5/17/03	21:15-22:15	Kings Hwy@3rd Ave S (SB)	01543	01920
5/17/03	22:15-22:40	Kings Hwy@3rd Ave S (NB)	01534	01788
5/17/03	22:15-22:40	Kings Hwy@3rd Ave S (SB)	01615	01740

As Sunday, May 18 marked the closing of Harley Week 2003, with many participants planning to leave the area, the team returned to Clemson.

Black Bike Week 2003

The team returned on Friday, May 23, 2003 to begin data collection for Black Bike Week. In Harley Week the previous weekend, the team saw high traffic demand during the traditional evening cruising period. Expecting a similar situation during Black Bike Week, the team was interested in the performance of the street system with Ocean Boulevard restricted to one-way flow. Initial observations of the study area during the early evening confirmed that traffic was congested, especially along Ocean Boulevard. Unlike Harley Week, congestion along Ocean Boulevard appeared to extend through the downtown area and beyond to the south. Data was collected at several points along Ocean Boulevard, Kings Highway, and connecting streets during the late evening hours of May 23.

During the morning of Saturday, May 24, the team examined the study area and again found traffic to be light. Accordingly, data collection resumed at 1:55pm. Team members again were stationed at various points. Probes of Ocean Boulevard as the afternoon progressed indicated that congestion extended well to the south of the downtown, and heavy traffic was also observed in the parallel northbound portions of Kings Highway. Accordingly, the team increased coverage in these areas. Data collection continued until 10:40pm. The team returned to Clemson on Sunday, May 25.

Table 2 summarizes the locations and duration of the Black Bike Week counts. As in Table 1, flow rates represent totals for both directions unless a direction is indicated.

Table 2. Count Data-Black Bike Week 2003

Date	Time	Location	Average Flow Rate (veh/hr)	Maximum Flow Rate (veh/hr)
5/23/03	21:00-21:35	Ocean Blvd@17th Ave S (SB)	00799	01020
5/23/03	21:00-21:35	17th Ave S@Ocean Blvd	00425	00636
5/23/03	21:35-22:35	Ocean Blvd@21st Ave N (SB)	00344	00744
5/23/03	21:35-22:35	21st Ave N@Ocean Blvd	00280	00504
5/23/03	20:50-22:15	Kings Hwy@3rd Ave S (NB)	01426	01884
5/24/03	13:55-15:10	Kings Hwy@21st Ave N (NB)	01906	02628
5/24/03	13:55-15:15	Kings Hwy@21st Ave N (SB)	02483	02916
5/24/03	14:00-15:00	Ocean Blvd@3rd Ave S (SB)	00475	00648
5/24/03	14:00-15:00	Kings Hwy@3rd Ave S (SB)	01755	02112
5/24/03	14:00-15:00	Kings Hwy@3rd Ave S (NB)	01058	01608
5/24/03	15:50-16:50	Kings Hwy@17 Ave S (NB)	00532	01068
5/24/03	15:50-16:50	Kings Hwy@17 Ave S (SB)	01149	01872
5/24/03	13:55-17:40	Ocean Blvd@21st Ave N (SB)	00439	00804
5/24/03	16:00-17:00	Ocean Blvd@16th Ave S	00641	01128
5/24/03	20:50-22:50	Ocean Blvd@21st Ave N (SB)	00297	00696
5/24/03	20:50-21:50	Kings Hwy@21st Ave N (SB)	02316	02568
5/24/03	20:50-21:50	Kings Hwy@21st Ave N (NB)	01934	02472
5/24/03	21:50-22:50	Kings Hwy@21st Ave N (SB)	02112	02688
5/24/03	22:00-22:50	Kings Hwy@21st Ave N (NB)	01979	02556
5/24/03	21:00-22:00	Ocean Blvd@4th Ave S (SB)	00488	00948
5/24/03	21:15-22:40	Kings Hwy@3rd Ave S (NB)	00646	01320

COMPARISON OF EVENTS

This section of the report compares the two events based upon the team observations and collected data.

General Observations

The following are general observations from the two visits.

Racial Makeup of Attendees

The team observed distinct differences in the racial composition of the attendees to the two events. During Harley Week, the motorcyclists and accompanying crowds were predominantly Caucasian, although some African Americans were present. During Black Bike Week, the majority of the cyclists, and a significant portion of the roadside crowds were African Americans. A few Caucasians were seen on motorcycles and in the crowds along Ocean Boulevard.

Behavior of Attendees

During both weekends, the team was treated with courtesy by attendees. Numerous individuals expressed curiosity about the work being conducted by team members. All acted in a friendly

manner. Team members did not witness littering, cursing, or any other unseemly behavior frequently attributed to Black Bike Week participants.

Team members observed racy behavior on the part of both audiences. For example, it was not uncommon to see women wearing immodest clothing (e.g. thongs, bikini tops) during Black Bike Week. On the other hand, many women were observed baring their breasts in response to male prodding from the roadside during Harley Week.

In both groups, some motorcycle owners raced their engines and spun tires to attract attention. Cyclists at both events often rode in groups. The Harley motorcycles were much louder than the typical cycles observed during Black Bike Week. Despite the large numbers of cyclists, the team observed good compliance with traffic rules both weekends.

Presence and Role of Police

There was a very noticeable difference in the presence of law enforcement, especially along Ocean Boulevard, between Harley Week and Black Bike Week. During the Harley Week visit, law enforcement officers, if present, were not conspicuous along Ocean Boulevard. In contrast, police were present in numbers and highly visible during Black Bike Week. They also appeared to be taking a more aggressive stance. Team members observed officers wave several drivers to the curb for questioning. In addition, officers were directing pedestrians to keep moving along the sideways. The author was asked, in a reasonable but firm manner, to do so while taking photographs.

Despite being in position on Ocean Boulevard during periods of congestion, team members did not observe police officers directing traffic during either event. Traffic signals appeared to be operating normally, even during periods of very heavy traffic.

Pedestrian Traffic

Many pedestrians were present along Ocean Boulevard during both weekends. No attempts were made to measure pedestrian traffic. During Black Bike Week, the crowd tended to concentrate along the west side of Ocean Boulevard next to the through lanes of traffic. Sidewalks along the east side of the road were visibly less crowded. Most of the law enforcement officers appeared to be deployed along the east side of the Boulevard. During Harley Week, in comparison, crowds appeared to be more uniformly distributed along both sides of street.

The traffic control scheme employed on Ocean Boulevard during Harley Week provided pedestrians with a buffer zone between the sidewalk and lanes of traffic. During Black Bike Week, the traveled way was directly adjacent to the crowded sidewalks. In the author's opinion, the Harley Week plan provides for a higher level of pedestrian safety.

Traffic Behavior

This section compares the observed traffic characteristics. The principal operational differences between the traffic control plans for Harley Week and Black Bike Week can be summarized as follows:

- During Harley Week, traffic on Ocean Boulevard was permitted to move in both directions, with a single lane for each direction. During Black Bike Week, traffic on Ocean Boulevard was restricted to two lanes, with only southbound movement allowed.
- Right turns off of Ocean Boulevard were restricted to four locations during Black Bike Week (although traffic could enter the Boulevard at many more points). Egress during Harley Week was much less restricted.

Nature and location of congestion

While road congestion in the study area was present during both events, the amount and location of congested flow was markedly different. During peak periods of the Harley Week study, traffic queues extended north and south on Ocean Boulevard from the Pavilion area. Southbound traffic, for example, was dense and slow moving in the single travel lane back as far as 21st Avenue North. Northbound traffic was similarly congested back to 7th Avenue South. Beyond 8th Avenue North, northbound traffic on Ocean Boulevard moved much more freely; congestion dissipated for southbound traffic below 7th Avenue South. During Black Bike Week, in comparison, traffic congestion (queues, slow speeds, stop and go behavior, high vehicle density) was observed almost continuously along Ocean Boulevard between 29th Avenue North and the Kings Highway intersection. The congested region is clearly visible in the aerial photographs taken Saturday afternoon, May 24.

Congestion on Kings Highway was also much more severe during Black Bike Week. The Harley Week observations revealed periods of congested southbound traffic between 29th Avenue South and the Ocean Drive Intersection, congestion in both directions between 13th Avenue South and 23rd Avenue South, and congested northbound traffic between 5th Avenue South and 8th Avenue North. Outside of these areas, traffic appeared to be moving reasonably smoothly. The team observed a different pattern during Black Bike Week. Northbound traffic on Kings Highway was extremely congested from the intersection with Ocean Boulevard to 8th Avenue North. Late in the evening of May 24th, the congested region was observed to extend through the Ocean Boulevard intersection about 1.3 miles to the south. Aerial photographs show the queue extending about 0.6 mile south of the intersection Saturday afternoon.

Influences on Roadway Capacity

Traffic flows on roadways are of two types: uninterrupted and interrupted. During uninterrupted flow, the characteristics of the traffic stream (speed, flow rate, density) are influenced by interactions between the vehicles, drivers, and the roadway environment. Such flow is typical of freeways and sections of other roads sufficiently distant (>2.0 miles) from traffic signals and STOP signs. Interrupted flow, in comparison, occurs when some external influence, such as a traffic signal, disrupts flow. Urban roads with closely spaced signalized intersections, such as portions of Ocean Boulevard and Kings Highway in the study area, experience interrupted flow.

Capacity is defined as the maximum hourly flow rate at which vehicles can reasonably be expected to traverse an intersection or road segment under prevailing geometric, traffic, and control conditions. Under uninterrupted flow conditions, lane capacity is the primary determinant of the road's ability to handle traffic. For interrupted flow with signalized intersections, the signal settings determine the maximum flow rate. Of course, adequate lane capacity must still be provided to carry traffic between and through intersections.

Capacity is a maximum value-a facility can handle no more than the capacity flow rate. When demand exceeds facility capacity (road or intersection), vehicle queues develop upstream from the facility and congestion results. With interrupted flow, the vehicle queues can spill upstream into adjacent intersections, adversely affecting their operation. Congested flow is unstable, resulting in slow speeds and frequent stops. Only when demand drops below capacity will the congestion dissipate and acceptable operations resume.

Operational Impacts of the Traffic Control Plans

It is apparent that the signalized intersections along Ocean Boulevard are a major influence on congestion during both Black Bike Week and Harley Week. During the events, congestion extends upstream from signalized intersections. During Harley Week, the congestion dissipated downstream from the last signal encountered on the Boulevard regardless of the approach direction. In contrast, during Black Bike Week, congestion on Ocean Boulevard did not dissipate. Given that the lane and intersection capacity was the same for both events, why did this occur?

The Harley Week plan allowed motorists to approach the Pavilion area on Ocean Boulevard from both directions, and count data revealed that they were indeed doing so. Flow rates upstream of downtown were generally somewhat less than those downstream. In periods of high demand, lower flow rates indicate congested conditions, which the team observers confirmed. Some congestion was inevitable given the magnitude of the event. During Black Bike Week, all traffic had to approach downtown from the north. Despite the presence of two southbound lanes, flow rates on the Boulevard north of downtown were as much as half those observed at equivalent times during Harley Week.

One reason for the severe Boulevard congestion upstream of the Pavilion area during Black Bike Week was the lack of egress points between 21st Avenue North and 3rd Avenue South. Motorists had to remain on the Boulevard through downtown to reach an egress point. In contrast, the Harley Week plan allowed drivers to exit Ocean Boulevard more frequently, avoiding congestion and reducing the downstream traffic load.

South of the Pavilion, the Black Bike Week plan maintained one-way flow on Ocean Boulevard to the intersection with Kings Highway. The two lanes nominally had the same overall capacity as the two-way arrangement of Harley Week. However, during Black Bike Week, both lanes fed directly into the Kings Highway intersection, whereas only one lane did during Harley Week. Drivers had to be aware of the limited number of egress points (3rd Avenue S, 13th Avenue S, and 17th Avenue S) to leave Ocean Boulevard. Either few drivers were, or the egress points also experienced congestion, as a large southbound flow proceeded to the intersection with Kings Highway, where observation indicated a majority returned northbound.

The team observed that the one way traffic pattern along Ocean Boulevard overwhelmed the Kings Highway intersection. The single lane turning roadway handling right (northbound) turns from Ocean Boulevard to Kings Highway received almost all traffic from the two southbound Boulevard lanes. This bottleneck represented a 50 percent reduction in capacity. Traffic from the single lane then had to merge into a heavy northbound flow along Kings Highway. With the heavy demand exceeding capacity of the single turning lane, a queue grew upstream along the Boulevard until it reached the signalized intersections downtown. This then resulted in further breakdown of the traffic flow approaching these intersections. This explains the observation of queues as far as 29th Avenue North during Black Bike Week.

The one-way flow pattern from Ocean Boulevard contributed to heavy northbound congestion on Kings Highway. This congestion was nowhere near as severe during Harley Week. Then, the two-way traffic on Ocean Drive resulted in more balanced flow and better performance along Kings Highway. The single lane of flow from Ocean Boulevard southbound to Kings Highway northbound was compatible with the capacity of the single lane turning roadway. Traffic in the reverse direction had separate lane capacity in the intersection.

The overall flow on Ocean Boulevard was further hindered during Black Bike Week by the operation of the downtown area traffic signals. With a heavy one-way flow pattern, restricted right turns, and no-left turns, the signals served no function. Yet, southbound drivers continued to obey them, further increasing congestion. Setting the signal to flashing mode and/or using officers to direct traffic would have increased intersection capacity.

CONCLUSIONS

The author makes the following conclusions based upon personal observation and analysis using data collected:

- The size of the two events is similar, and there is no clear reason why the Harley Week traffic control plan should not be used for both events. The traffic control plan for Black Bike Week greatly restricts the flow of traffic along Ocean Boulevard, resulting in congestion and contributing to a high level of driver discomfort.
- During Black Bike Week, numerous barricades restrict traffic from exiting Ocean Boulevard and moving to the west using cross streets. This exacerbates the traffic congestion on the Boulevard. Additional egress points would relieve the load on the signalized intersection at Ocean Boulevard and Kings Highway, which is at capacity, resulting in long queues.
- During Black Bike Week, signals along Ocean Boulevard continued to regulate the flow of traffic, despite capacity flows and/or lack of traffic from closed cross streets. This aggregated the congestion along Ocean Boulevard, as drivers continued to respond to the signal indications that were no longer warranted based on the closed side streets. In congested conditions during special events, police officers are much more effective for managing traffic flow. They were not observed doing this during either event.
- During Black Bike Week, right turn restrictions prevented traffic from exiting congested Ocean Boulevard, despite the relatively low conflict these movements represent under one-way flow conditions. This increased congestion by forcing vehicles to travel to one of the four egress points allowed by the plan.
- Based on observation, the Myrtle Beach road network as a whole maintained adequate capacity for north-south movement during both events, despite heavy congestion on Kings Highway and Ocean Boulevard. Both Highway 17 and the Grissom Parkway appeared to be performing at a reasonable level of service. Oak Street provided an alternative to Kings Highway for local residents. However, it did not appear that the traffic plan had any provision for alerting event participants or other visitors of the availability of these routes, or for encouraging the use of alternate routes by local residents. This resulted in demands well beyond capacity for both Ocean Boulevard and Kings Highway, especially during Black Bike Week.
- The one way southbound flow along Ocean Boulevard established by the traffic control plan for Black Bike Week exceeded the capacity of the intersection with Kings Highway. Congestion along the Boulevard extended upstream from the intersection far to the north. Traffic moved at crawl speeds, obviously resulting in lengthy delays to drivers. In combination with already heavy northbound traffic on Kings Highway, traffic discharged from Ocean Boulevard caused heavy congestion on Kings Highway north of the intersection. These levels of congestion were not observed on either road during the two-way flow pattern employed for Harley Week.

- I did not observe any behavior in the pedestrian or motor traffic along Ocean Boulevard that would have warranted a difference in the traffic control plan between the two events.
- Traffic moves much more smoothly during Harley Week, when vehicles are free to move between Kings Highway and Ocean Boulevard at more cross streets. I did not observe any reason why this pattern could not be employed during Black Bike Week.

The author reserves the right to revise these opinions and add opinions should additional data and information from site investigations, depositions, or the discovery process be provided. If warranted, the conclusions herein will be revised to reflect this information.

Signed:  Date: 8/31/04

David B. Clarke, Ph.D., P.E.